Onsite Wastewater Systems

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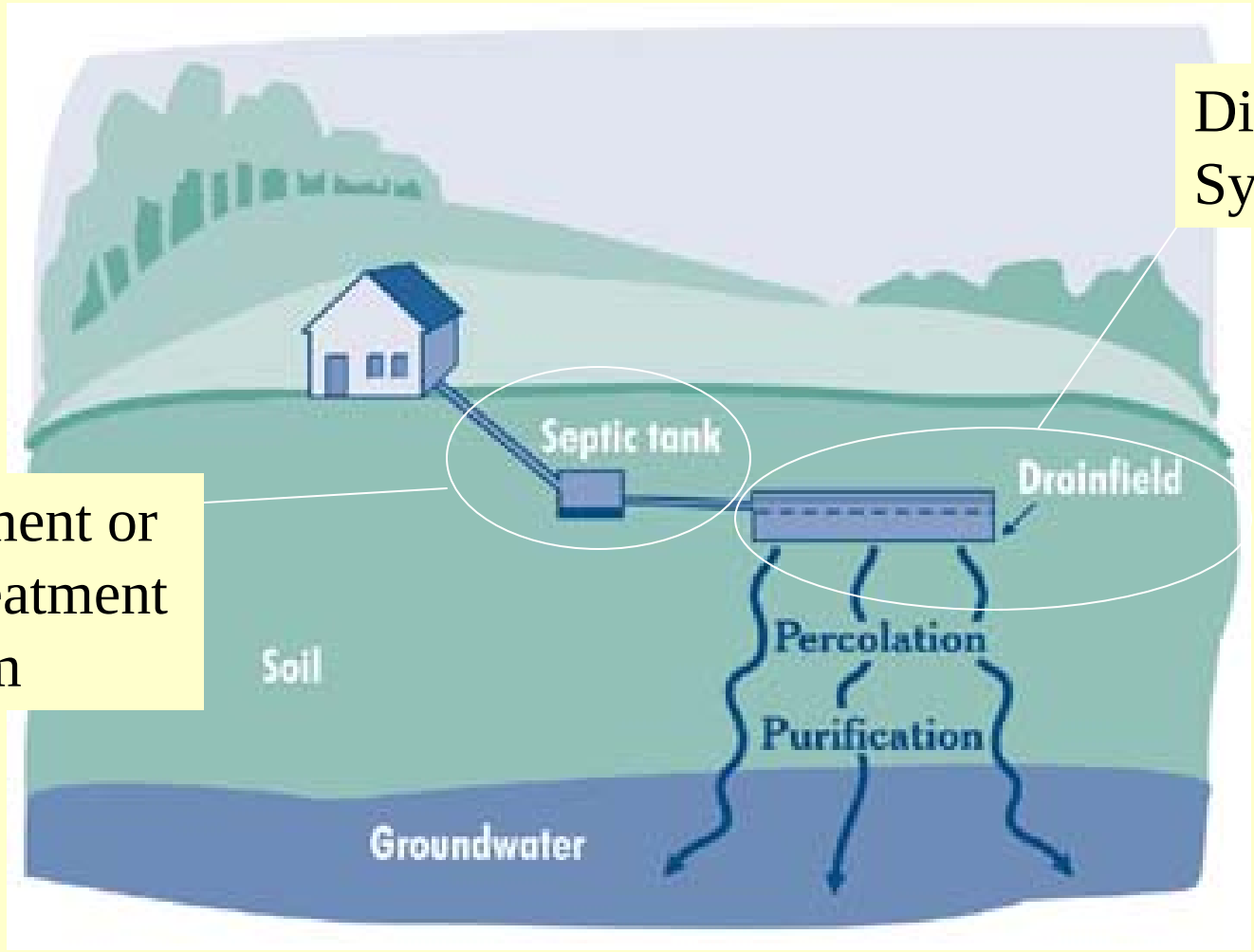
The Process



Dispersal System

Treatment or Pre treatment System

Onsite Wastewater Systems

A. Wastewater Treatment

Conventional Treatment

Septic Tanks

Alternative Treatment

Aerobic Treatment Units

Media Filters

Natural Systems

Waterless Toilets & Gray water Disinfection Systems

B. Soil Treatment and Dispersal

Conventional Treatment

Trenches

Alternative Treatment

Low Pressure

Drip

Spray

Sand Mound Filter bed

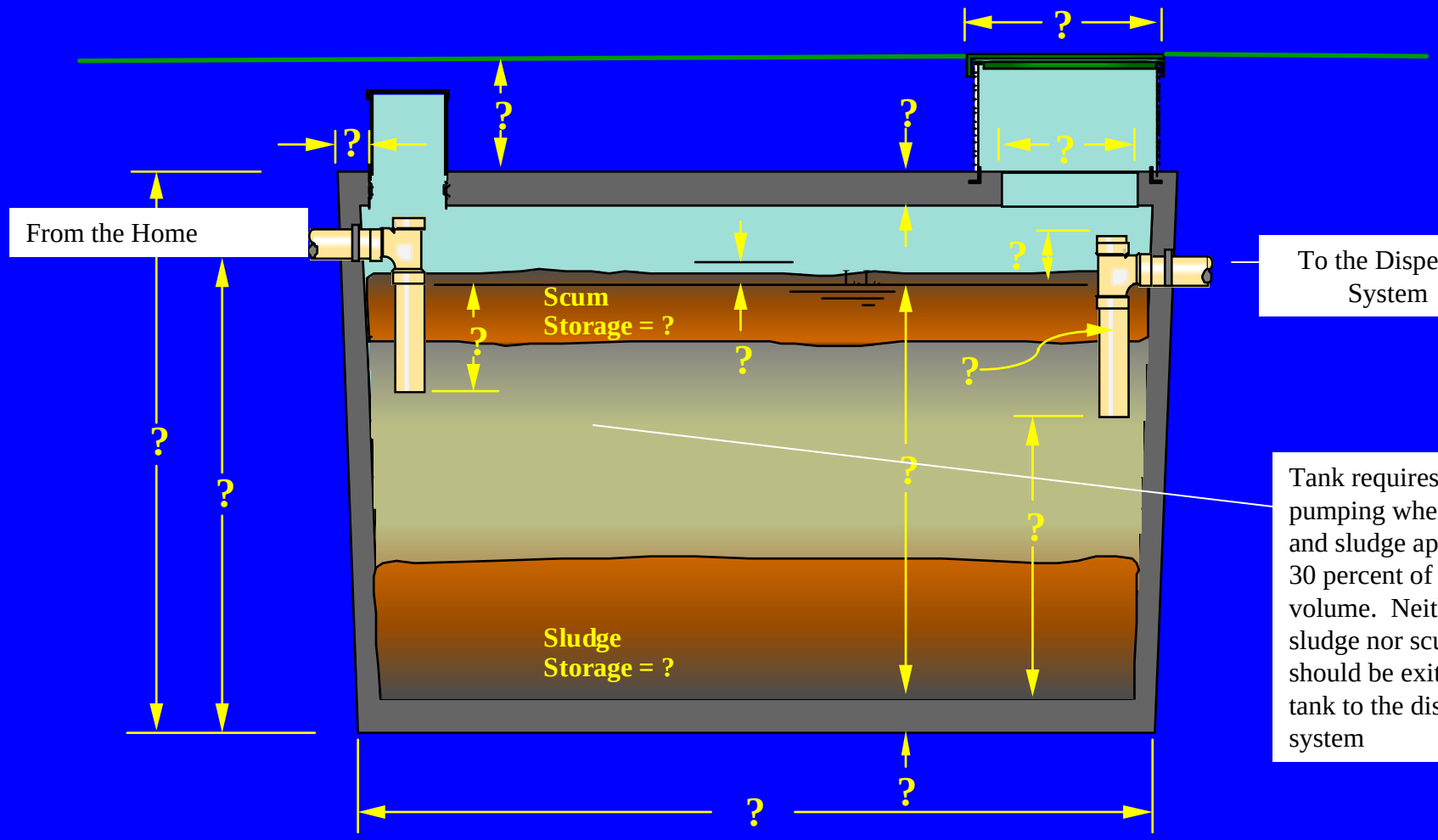
B. Direct Discharge after Treatment no Dispersal

Alternative Treatment

Disinfection Systems


WASTEWATER
Before going to the soil
Septic Tank
Secondary Treatment Most Aerobic Treatment
Advanced Treatment

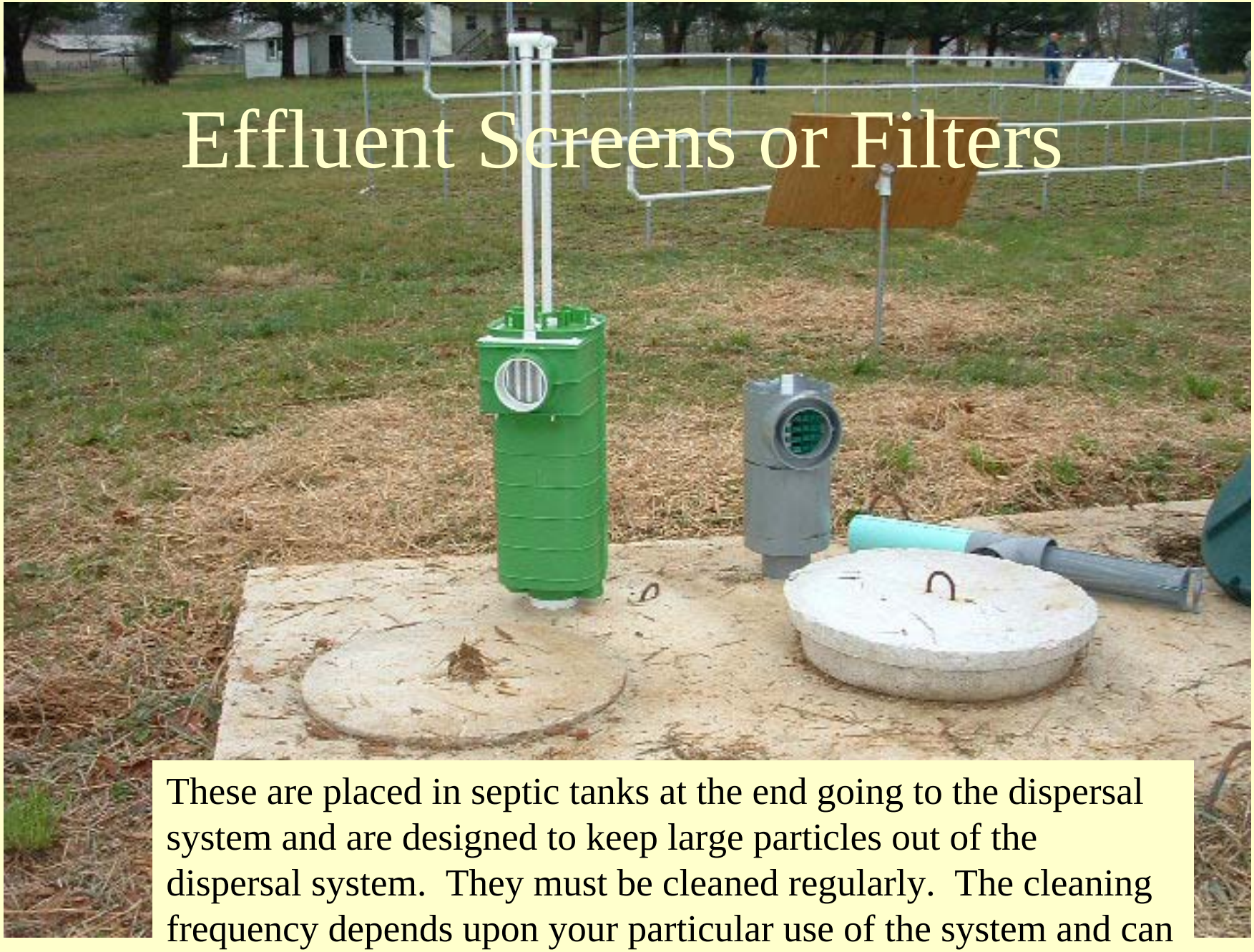
Septic Tank Sliced in half




Septic Tank

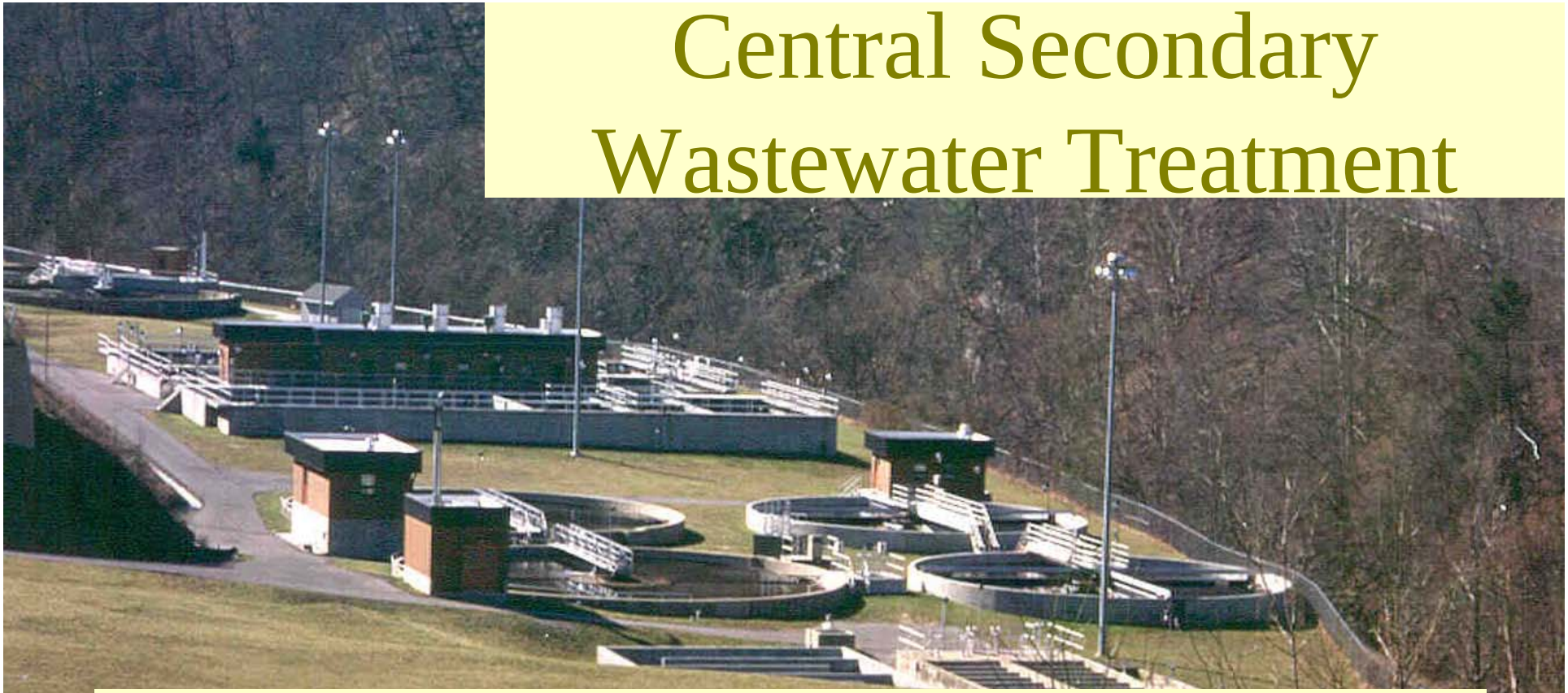
SEPTIC TANKS

Effluent Screens or Filters



These are placed in septic tanks at the end going to the dispersal system and are designed to keep large particles out of the dispersal system. They must be cleaned regularly. The cleaning frequency depends upon your particular use of the system and can range from monthly to annually

Central Secondary Wastewater Treatment



This is a centralized activated sludge wastewater treatment plant. Many of the Aerobic Treatment Systems are a miniature of this system which can be installed in the back yard. These systems are Alternative Treatment Works - Suspended Growth Media Aerobic Treatment Units commonly called ATU's. They produce Secondary Effluent as shown earlier. The Activated sludge is kept in suspension by air that is forced into the bottom of the tanks and thereby keeps them both aerobic and stirred up. The Treatment Works shown here has a separate tank for the Sludge to settle out from the effluent. In the backyard system it is a baffle that separates the aeration from the settling.

Onsite Secondary Treatment

From the surface in the back yard this is all one may see when peering into an ATU

Onsite Secondary Treatment

Secondary +

This is a combination suspended media and fixed media system. The egg carton looking material allows bacteria to attach to it rather than to be in constant suspension. Fixed Media bacteria typically are better at nitrifying ammonia.

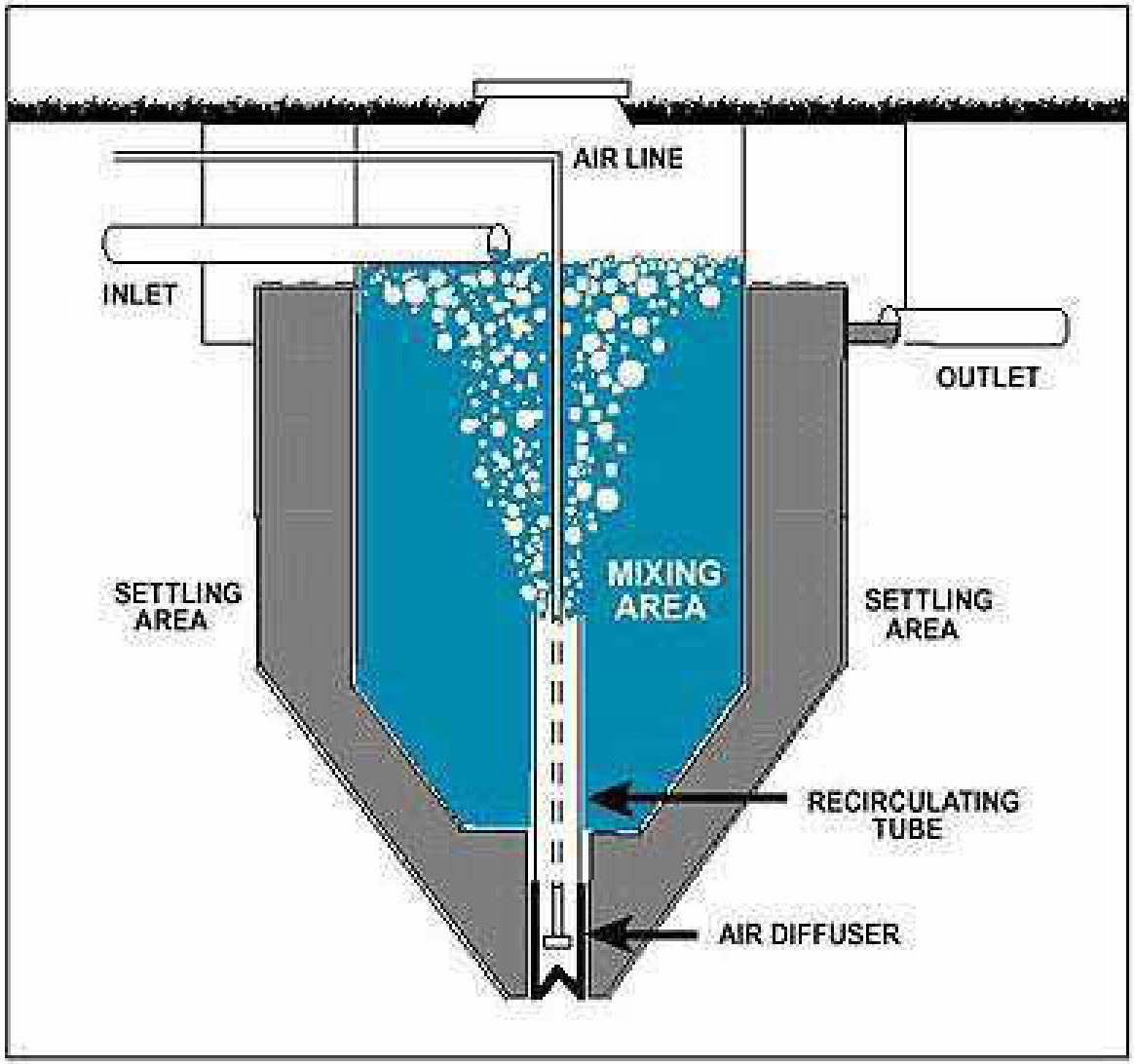
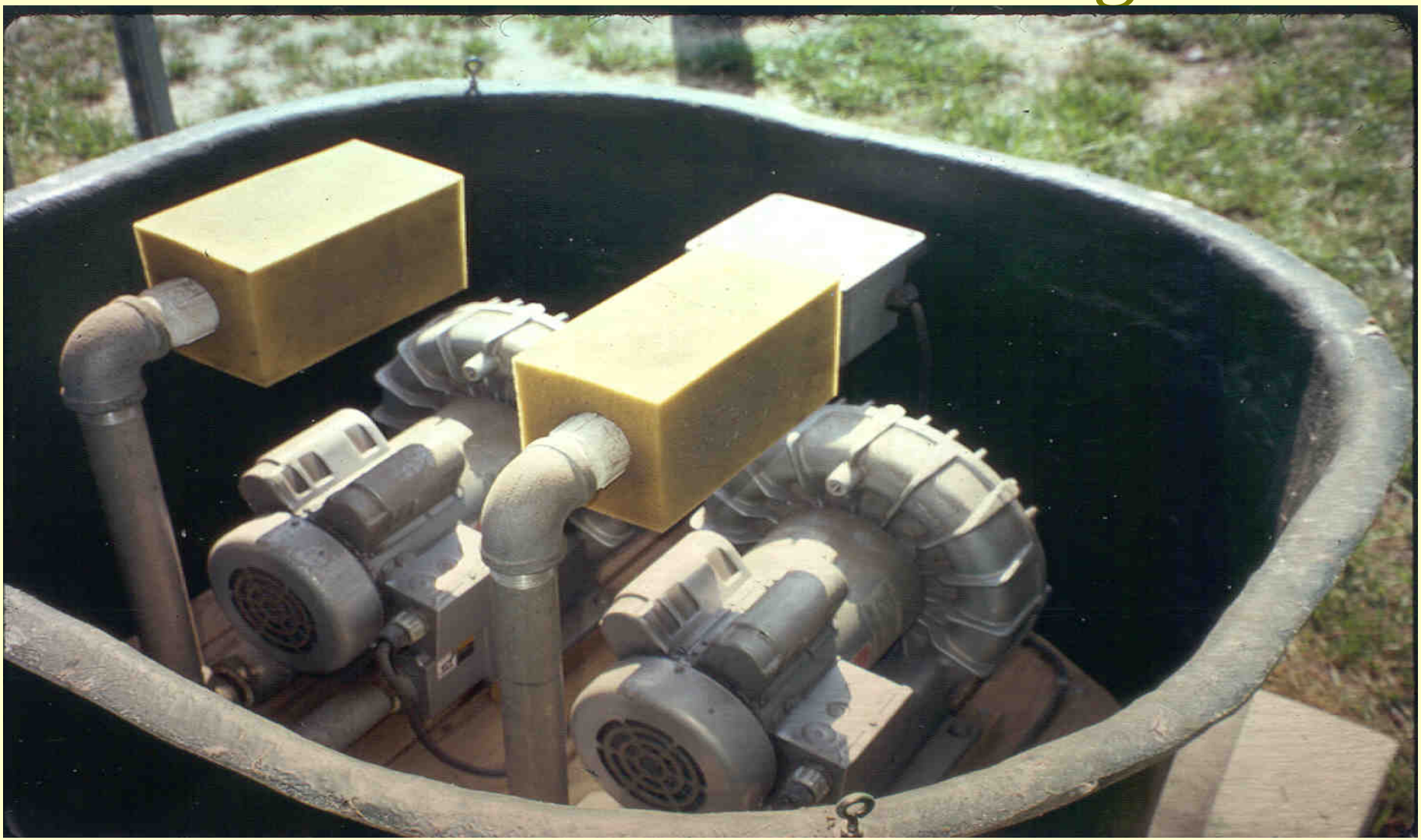


Figure 2—Another example of a possible aerobic unit design

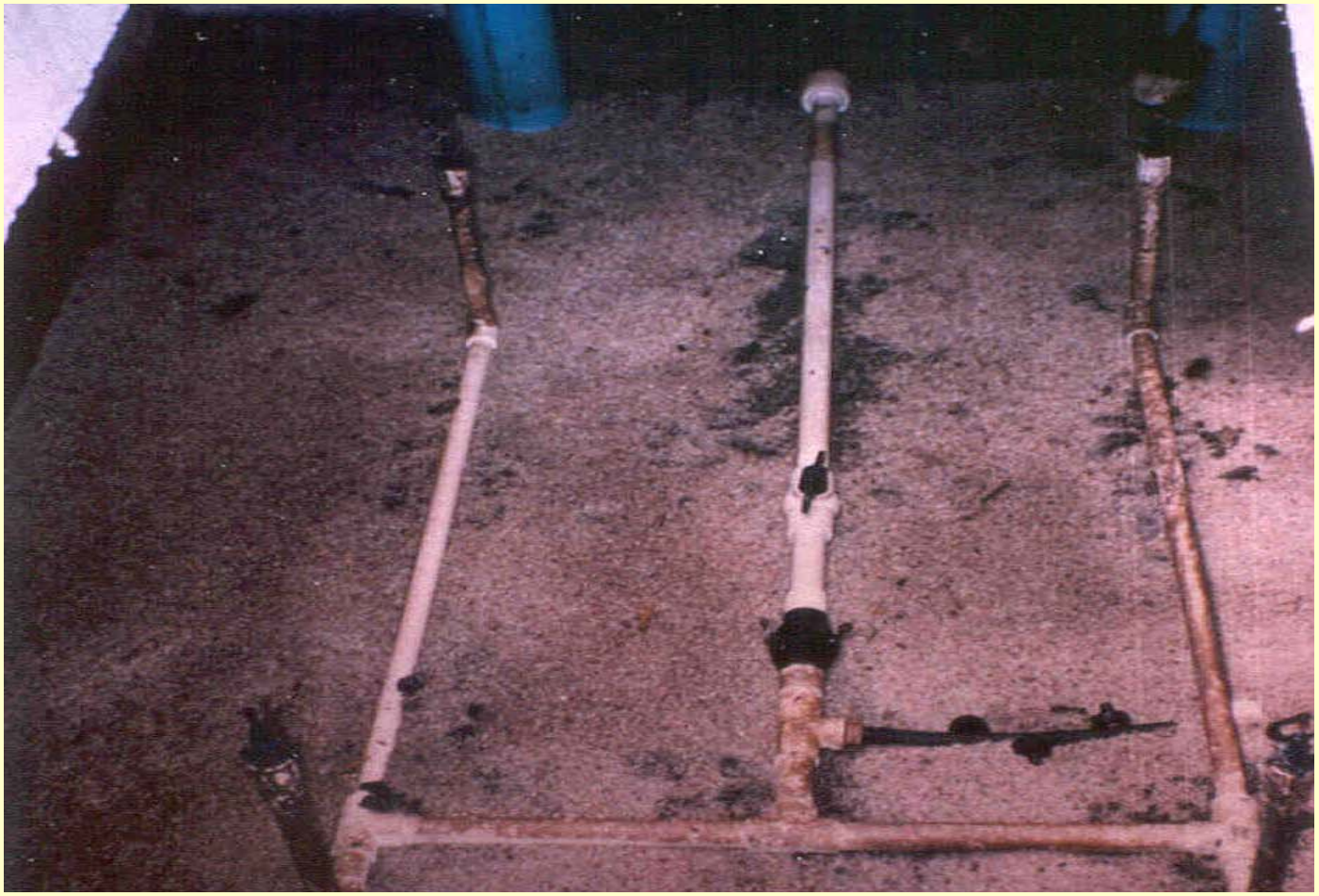
Adapted with permission from Pennsylvania State University College of Agriculture Extension Service

Air Blower and Housing



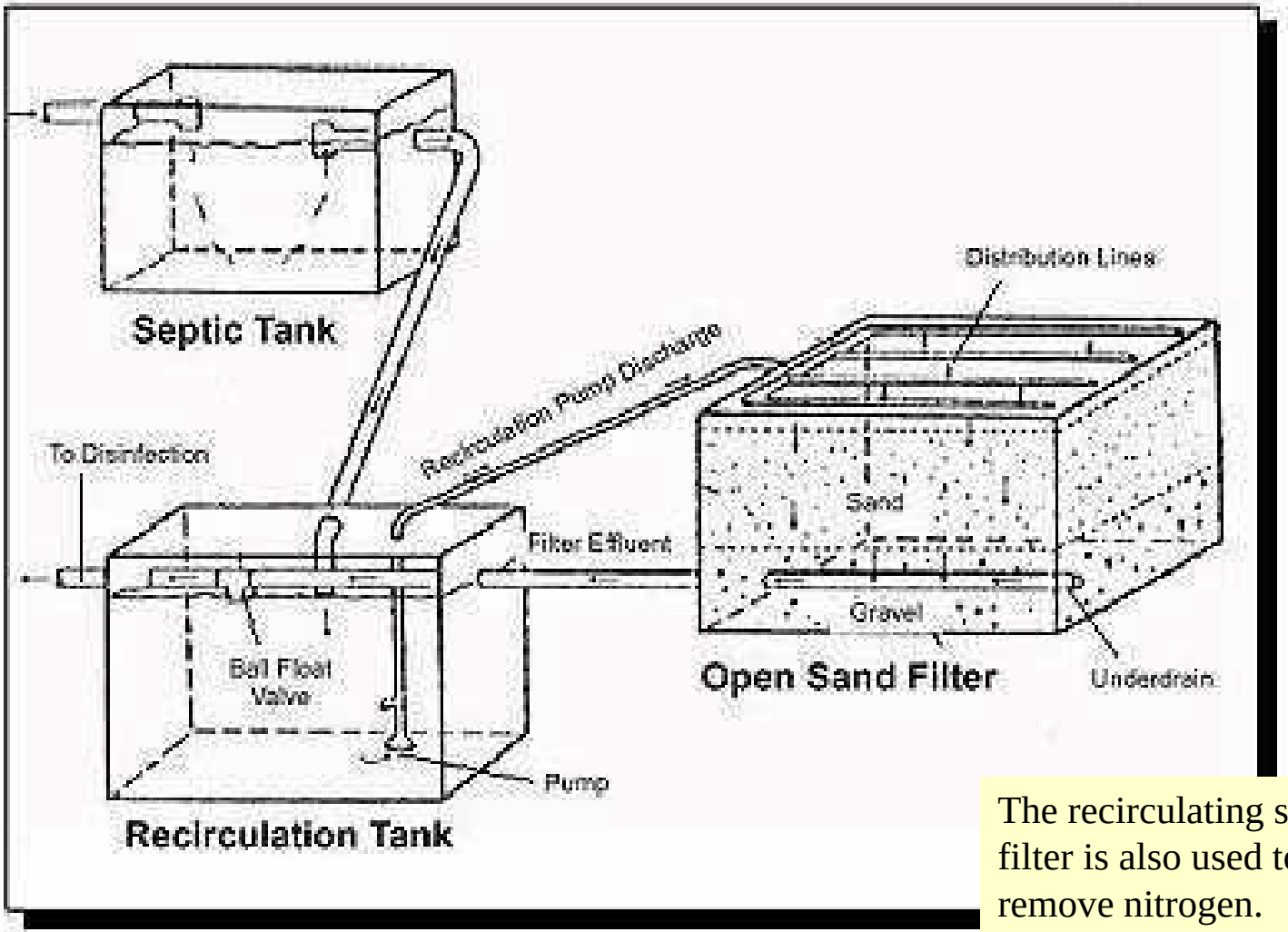
Larger Unit

Sand Filter



The Sand Filter is a fixed media aerobic system. The bacteria that remove the organic material from the wastewater attach themselves to the sand particles.

The bacteria are fed as the wastewater flows across the particles. They convert wastewater into carbon dioxide and water. Carbon dioxide goes to the air and water becomes part of the effluent and into the dispersal system.



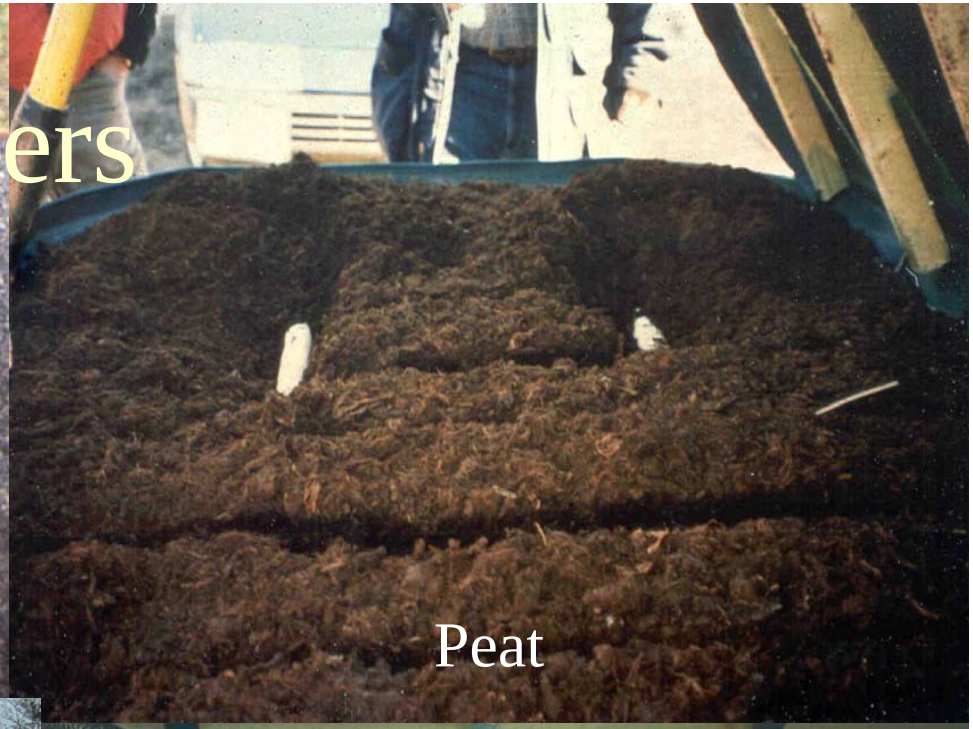
The recirculating sand filter is also used to remove nitrogen.

Figure 1: Typical Recirculating Sand Filter System

Adapted from: Hines and Favreau (1974) with permission

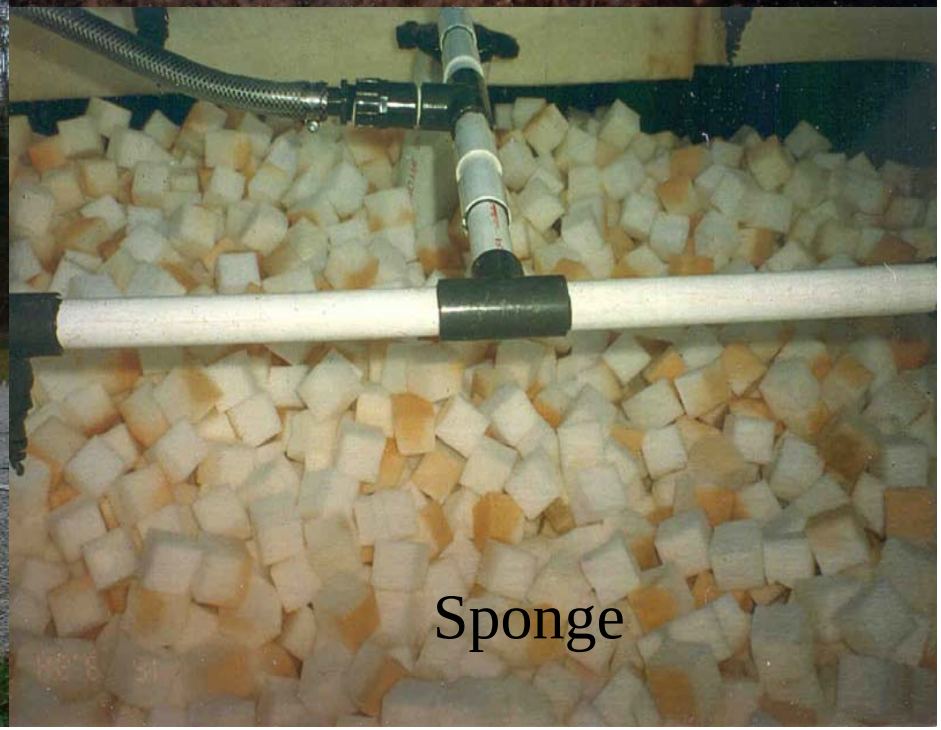
Other Media Filters

Textile Strips



Peat

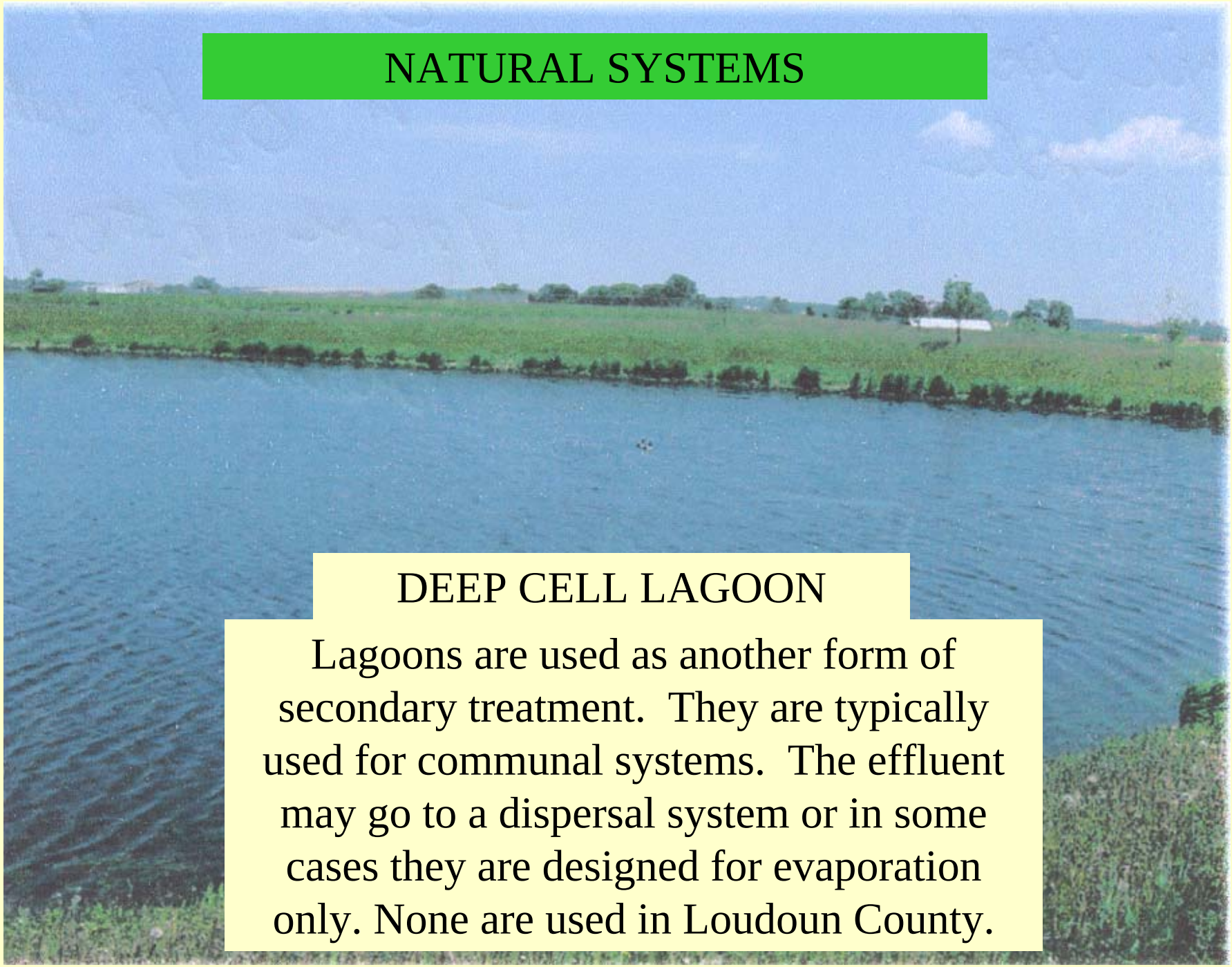
Communal Sand Filter
50 + homes



Sponge


Peat Filter Installed

NATURAL SYSTEMS

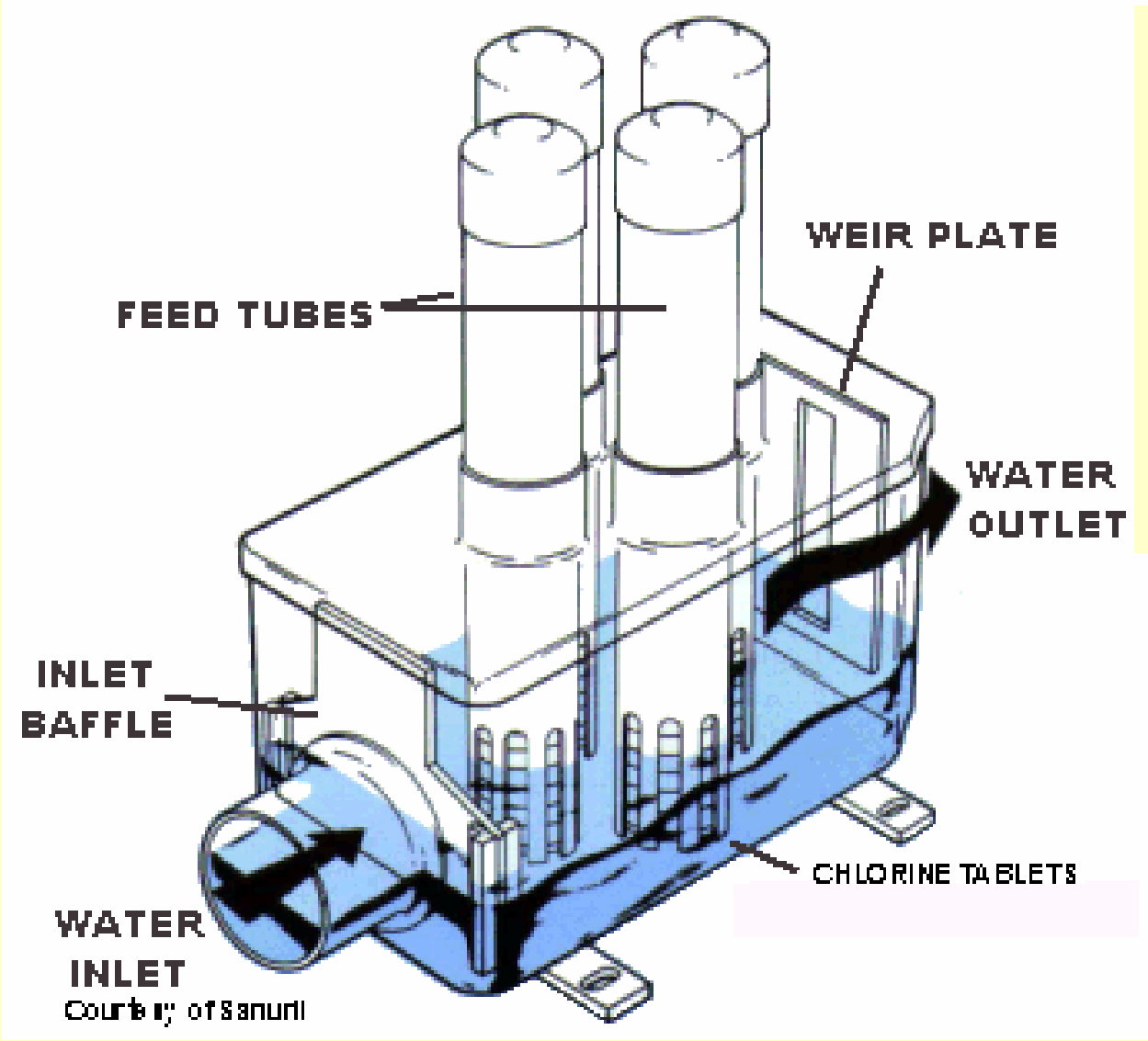


DEEP CELL LAGOON

Lagoons are used as another form of secondary treatment. They are typically used for communal systems. The effluent may go to a dispersal system or in some cases they are designed for evaporation only. None are used in Loudoun County.

Disinfection - Chlorine

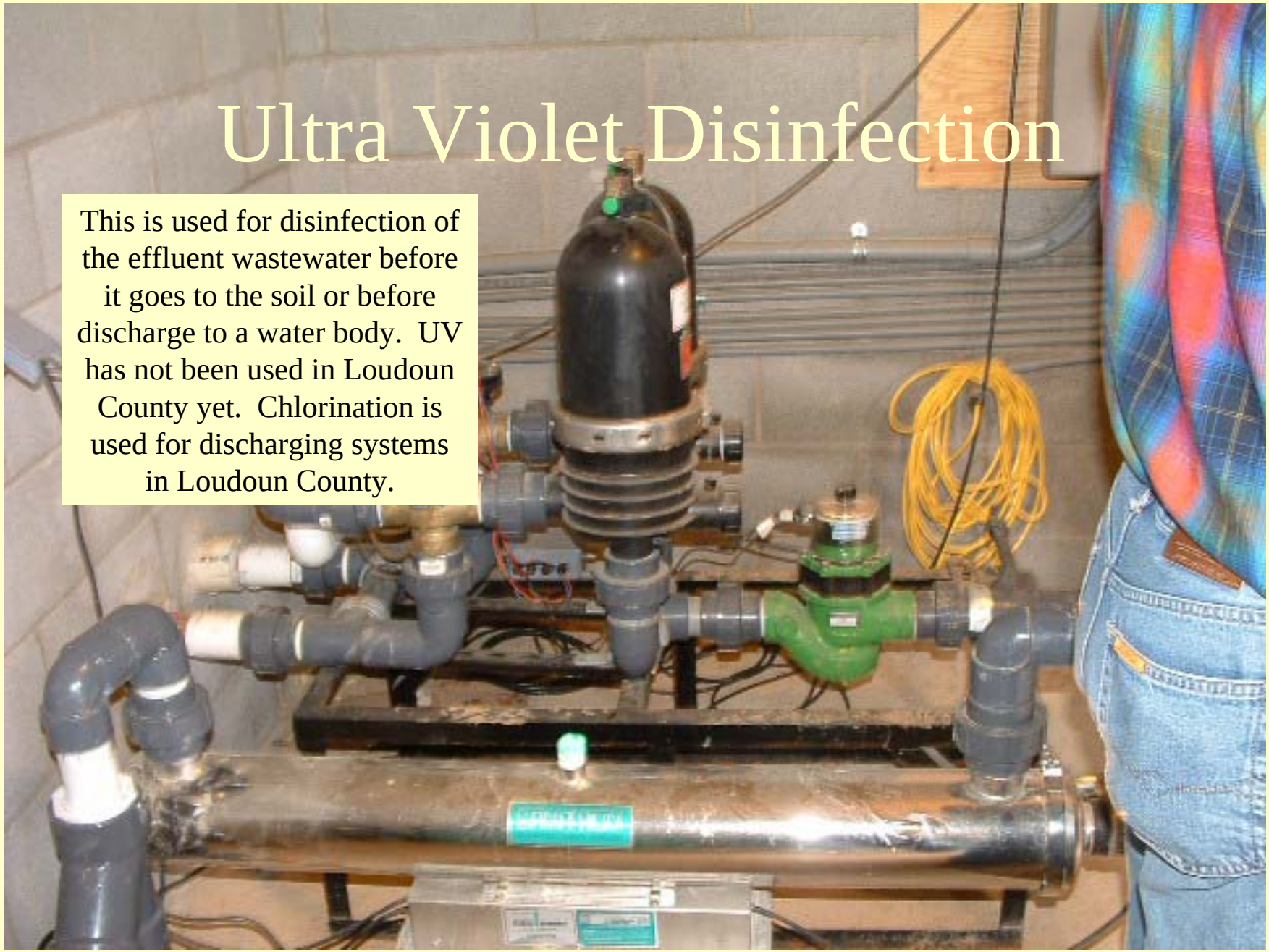
Disinfection is used in Loudoun County where Systems discharge to a creek or other water body. These systems must be maintained to assure the chlorine tablets are not hung up in the tubes.



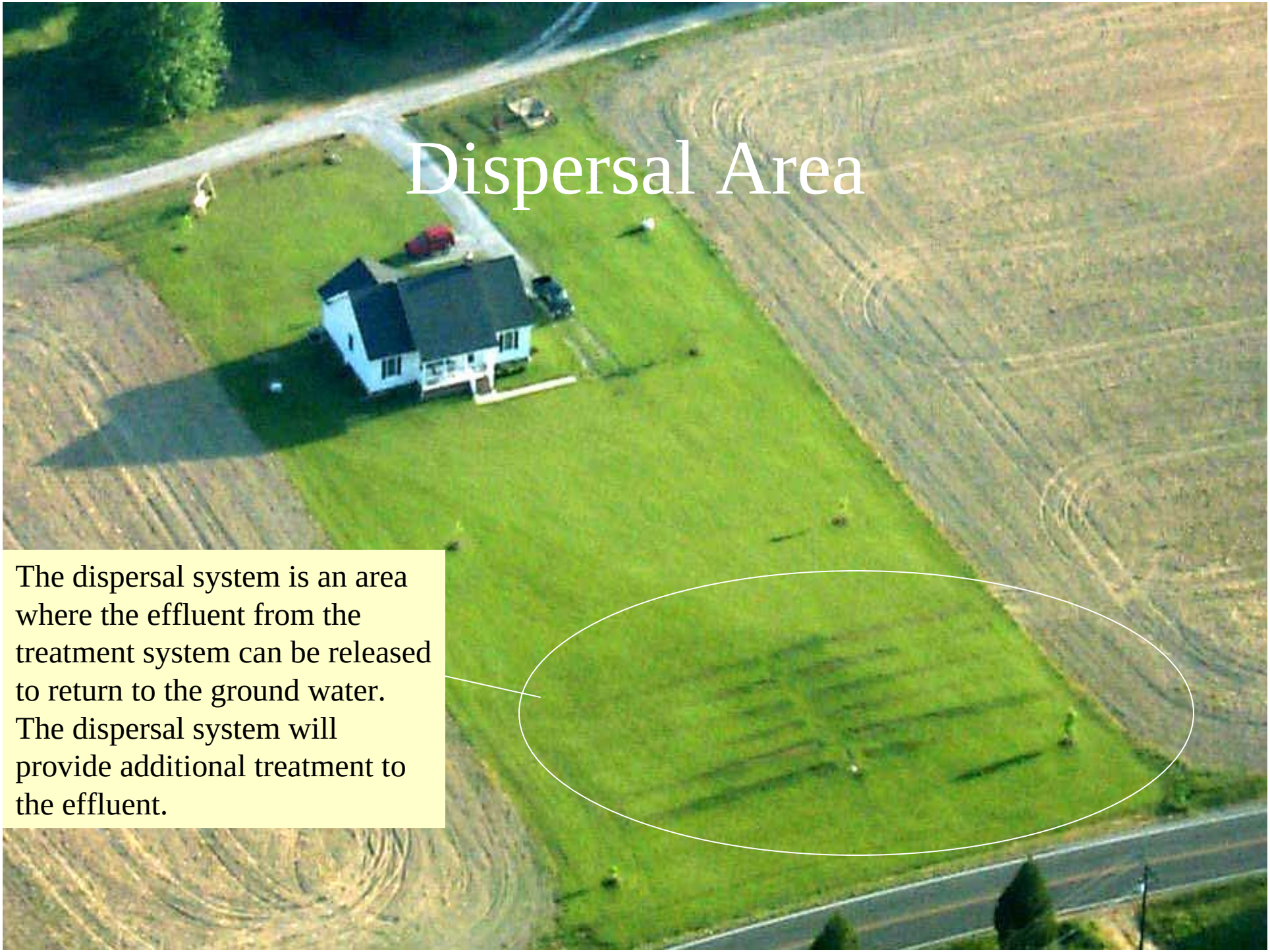
Most times a dechlorination system must be installed after the chlorinator so that too much chlorine will not get into the creek and kill the fish.

Ultra Violet Disinfection

This is used for disinfection of the effluent wastewater before it goes to the soil or before discharge to a water body. UV has not been used in Loudoun County yet. Chlorination is used for discharging systems in Loudoun County.

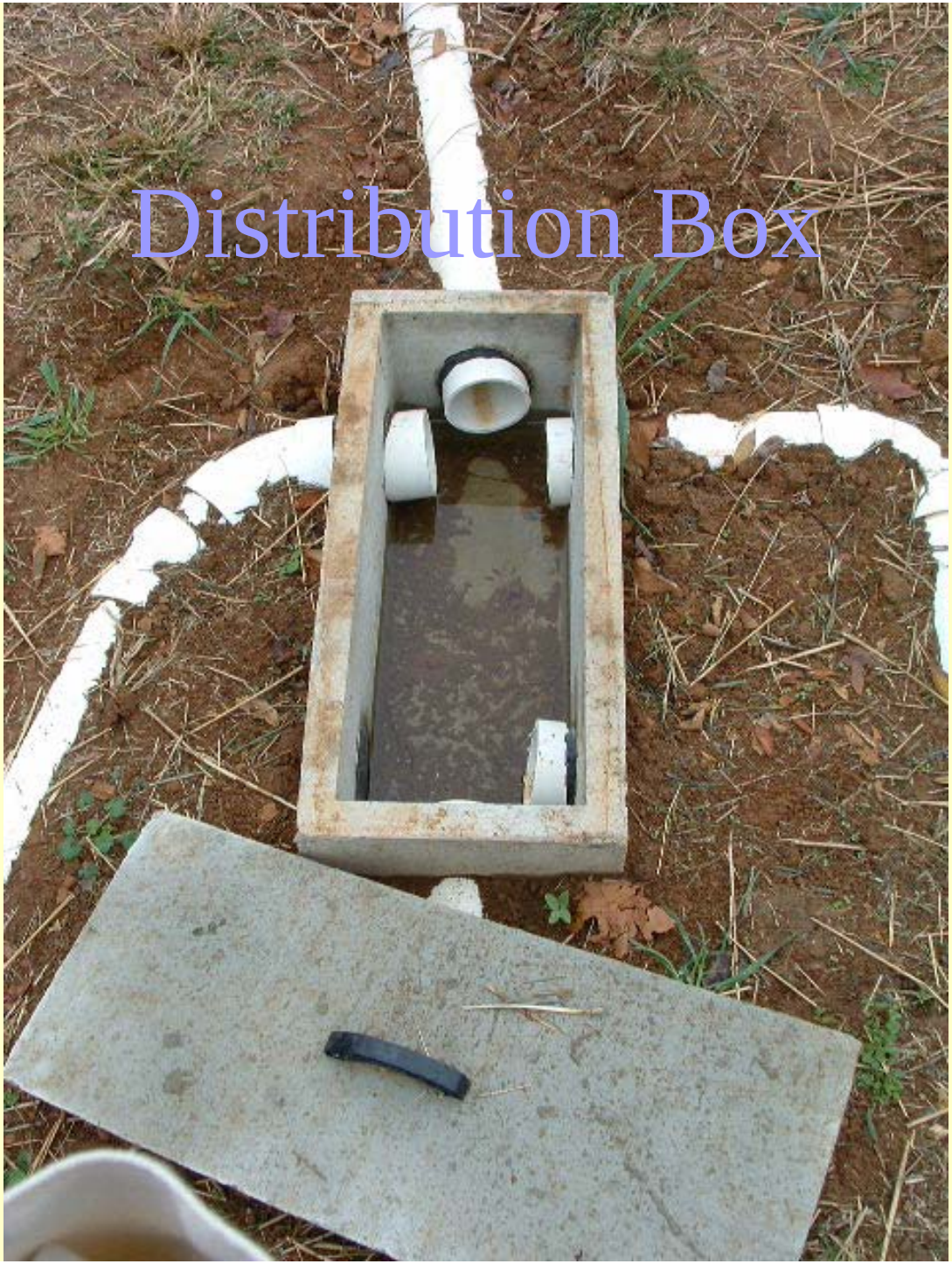


Dispersal Area

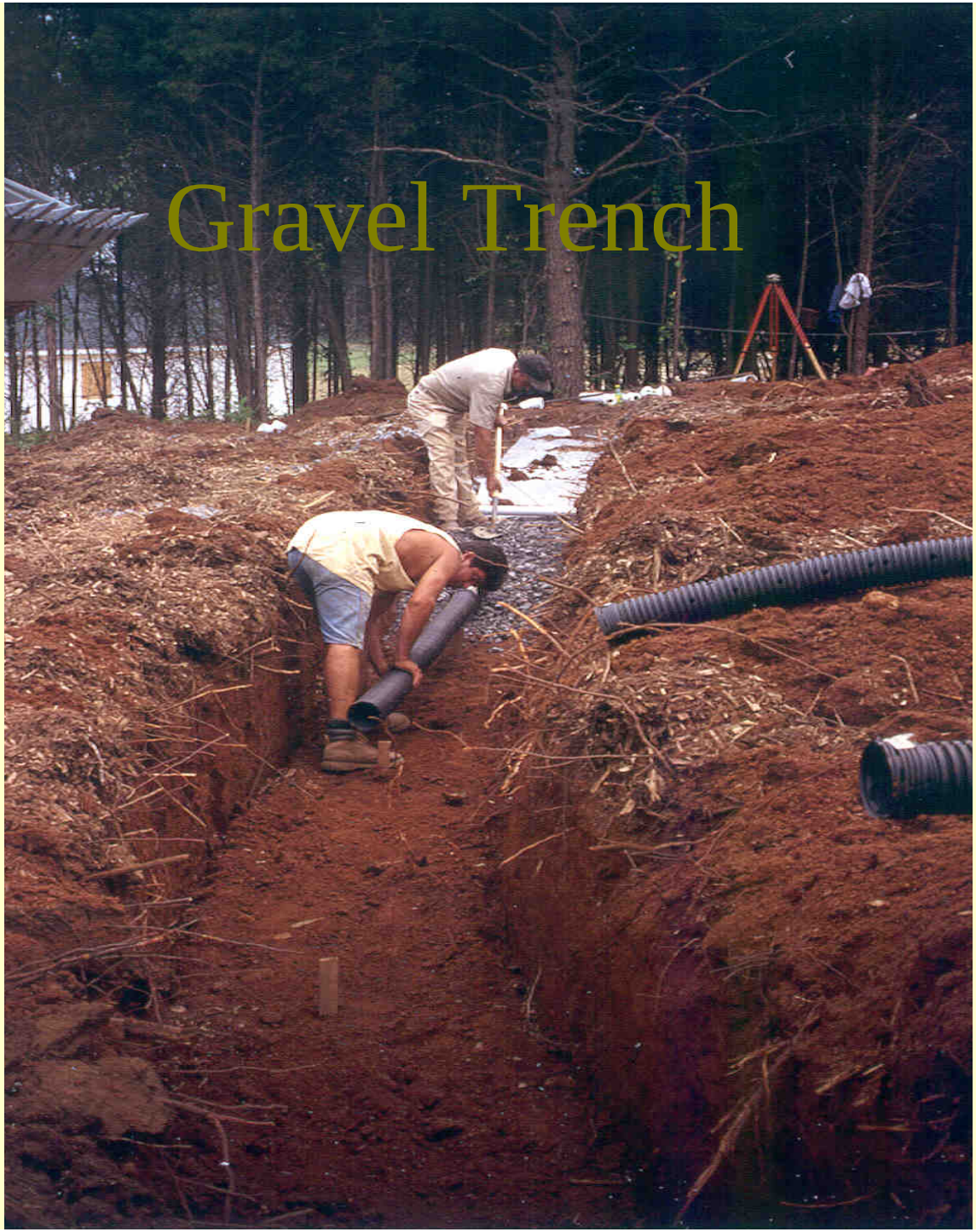


The dispersal system is an area where the effluent from the treatment system can be released to return to the ground water. The dispersal system will provide additional treatment to the effluent.

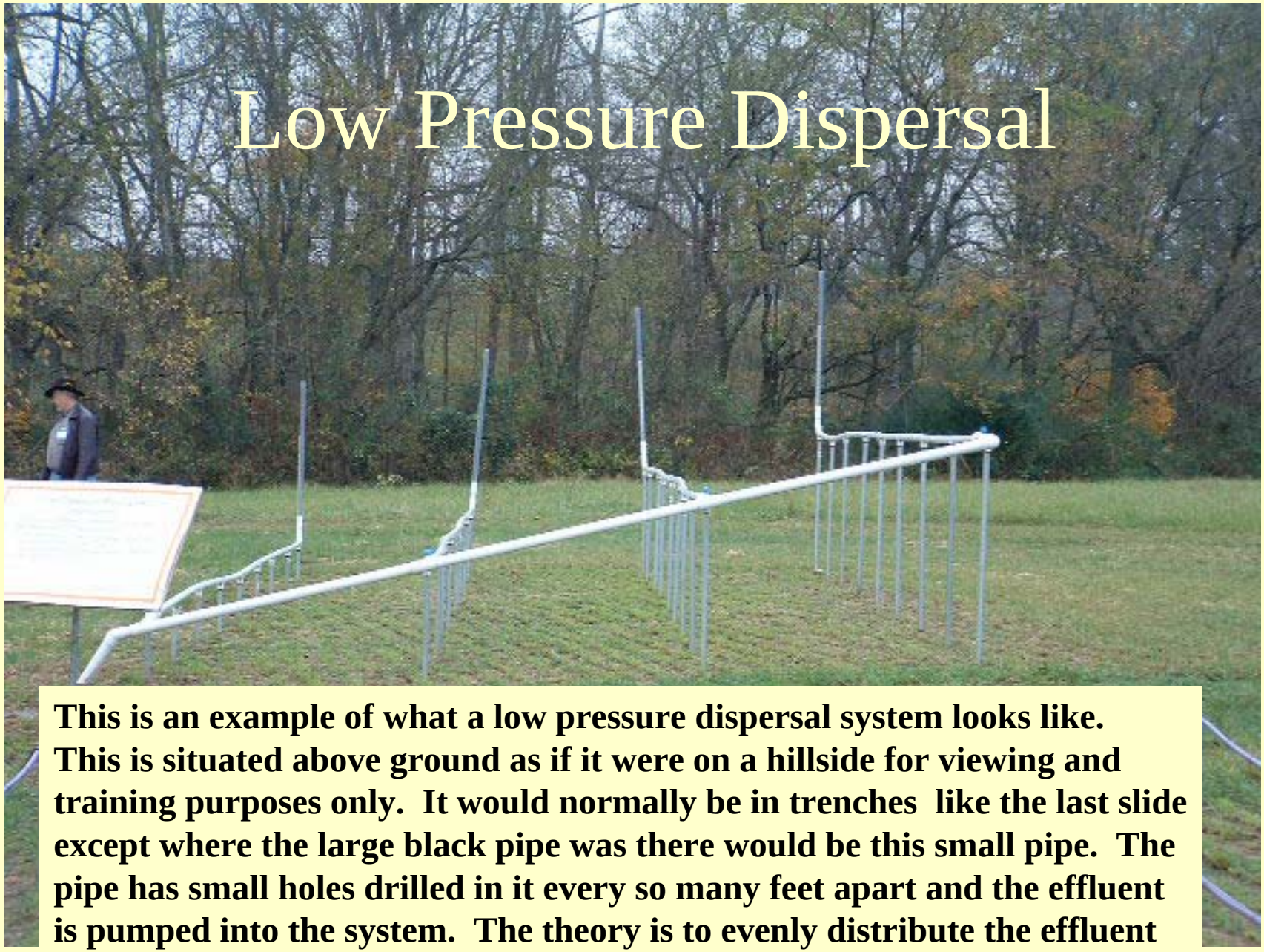
This separates the effluent from a septic tank into the necessary number of trenches which make up the dispersal system. It is critical that the box is level so equal flow goes to each trench.



Gravel Trench

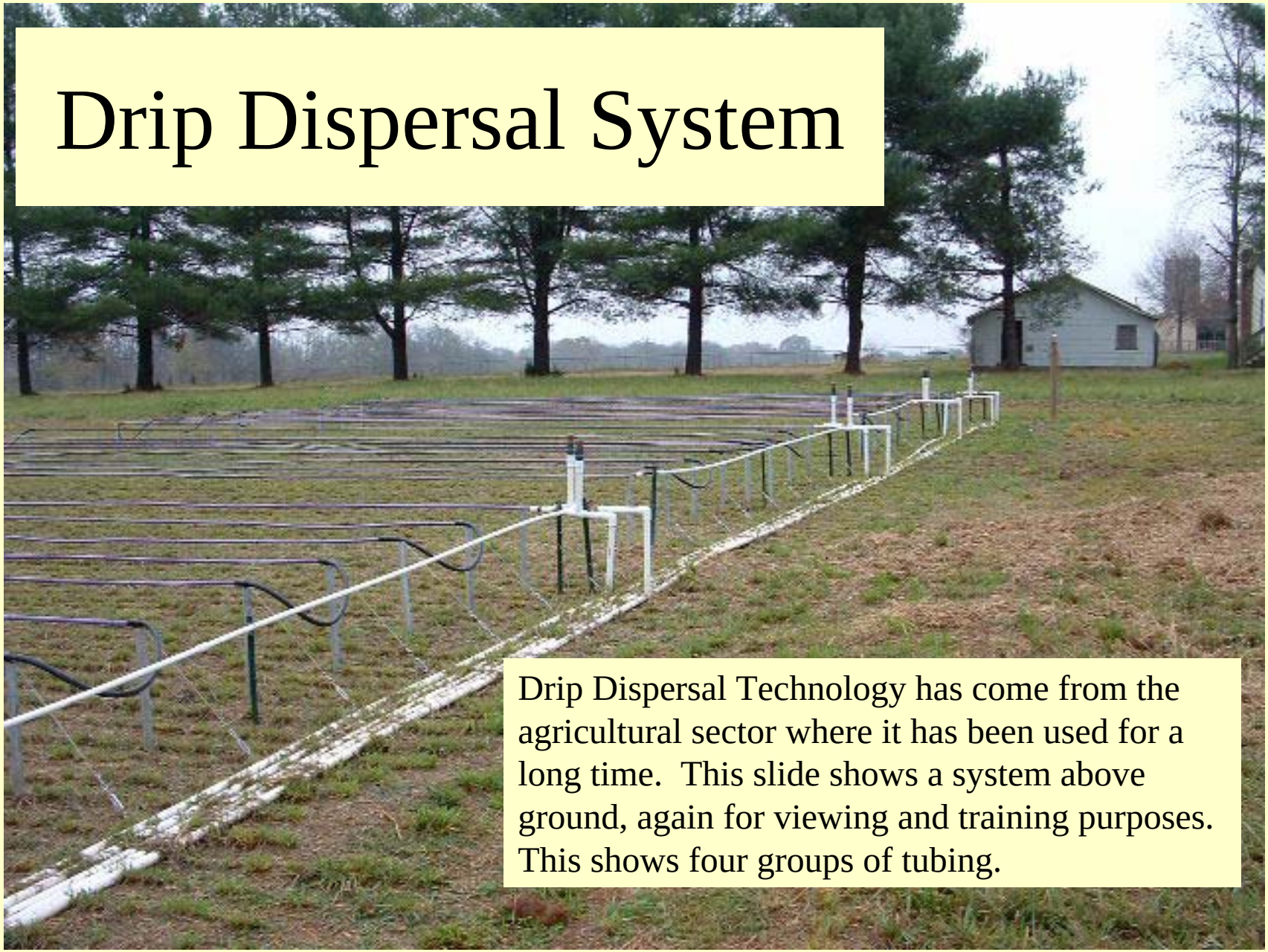


Low Pressure Dispersal

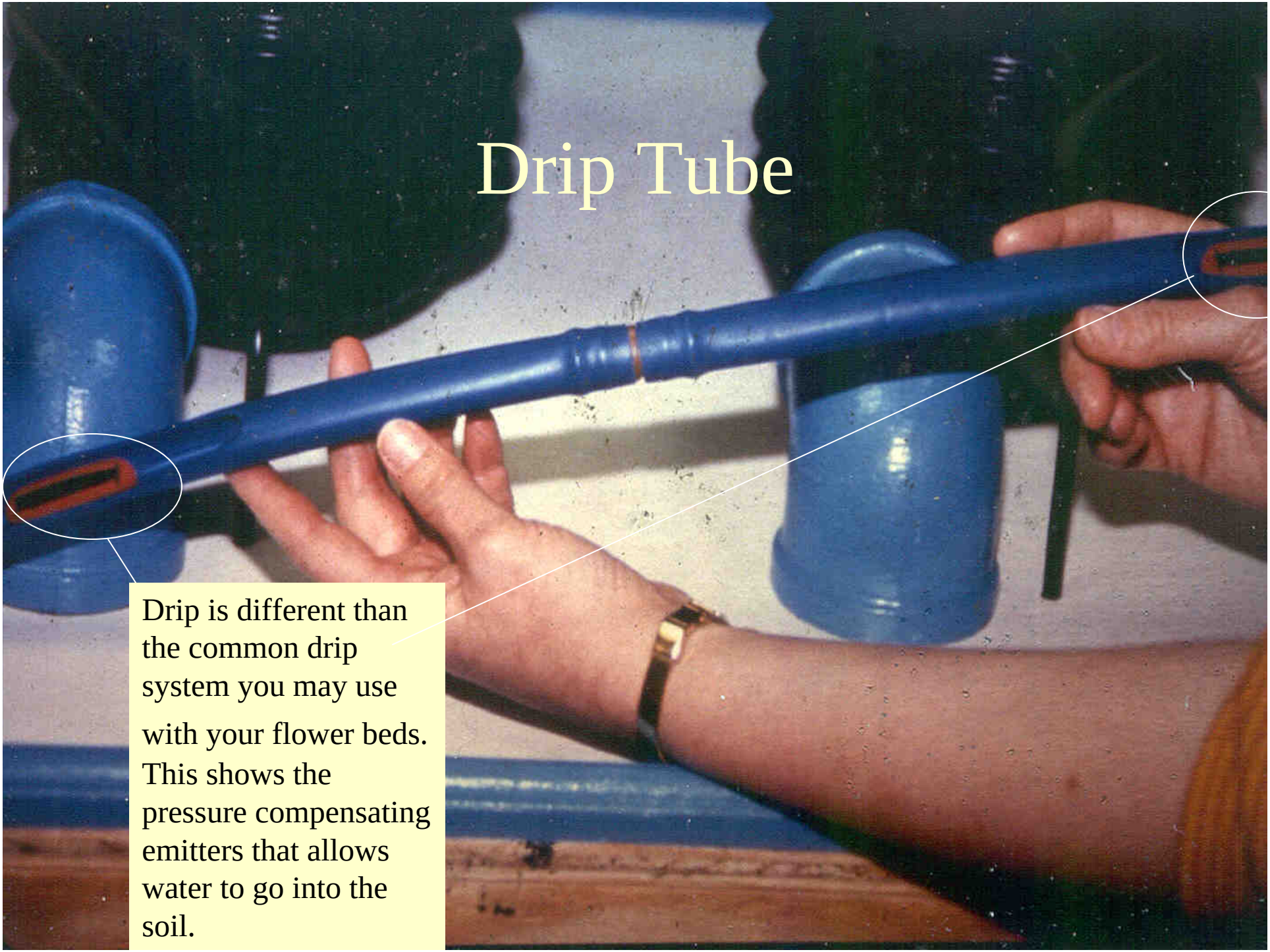


This is an example of what a low pressure dispersal system looks like. This is situated above ground as if it were on a hillside for viewing and training purposes only. It would normally be in trenches like the last slide except where the large black pipe was there would be this small pipe. The pipe has small holes drilled in it every so many feet apart and the effluent is pumped into the system. The theory is to evenly distribute the effluent across the entire trench evenly.

Drip Dispersal System



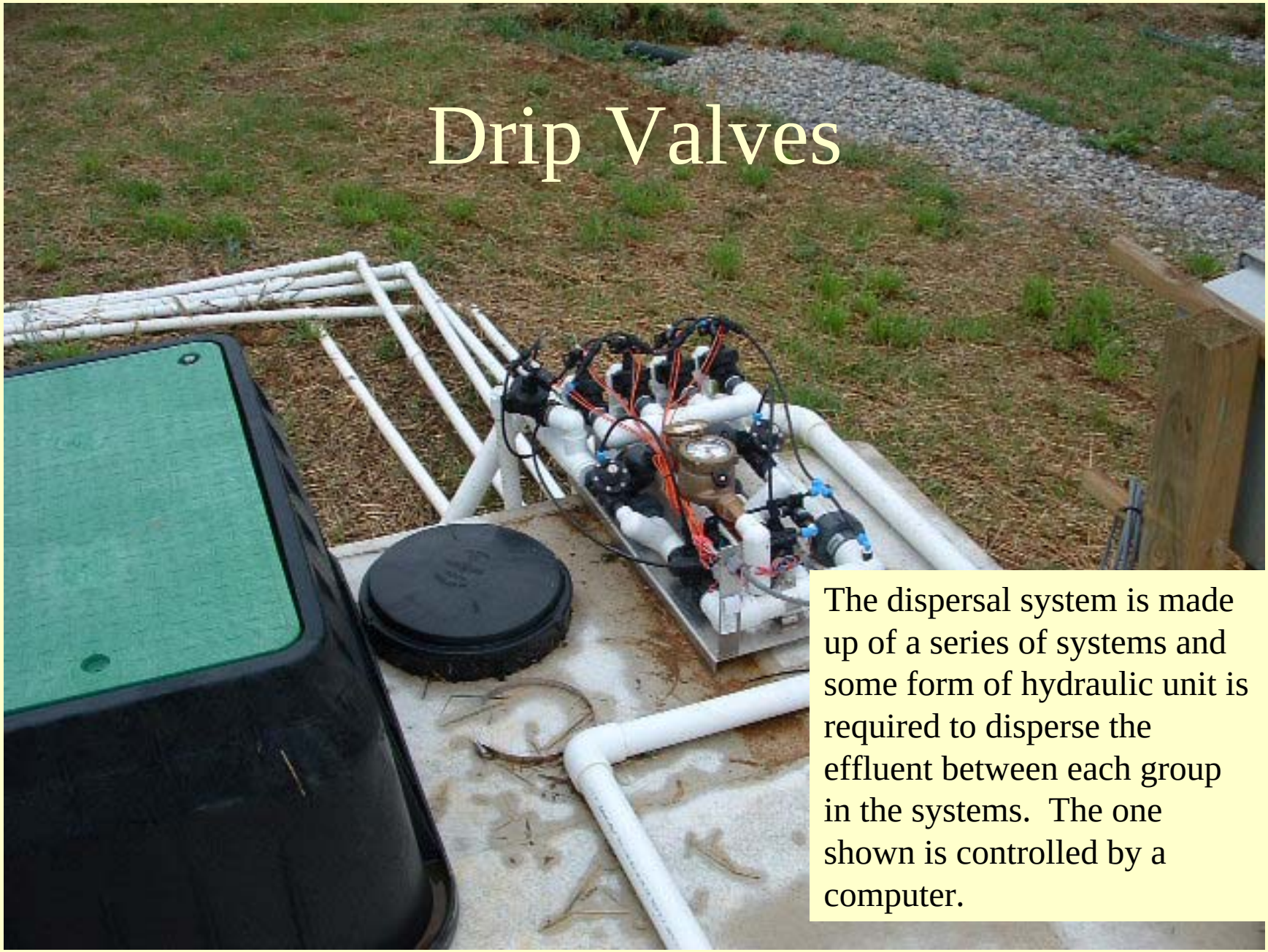
Drip Dispersal Technology has come from the agricultural sector where it has been used for a long time. This slide shows a system above ground, again for viewing and training purposes. This shows four groups of tubing.


Drip Tube
Drip is different than the common drip system you may use with your flower beds. This shows the pressure compensating emitters that allows water to go into the soil.

Drip tube can be plowed into the soil

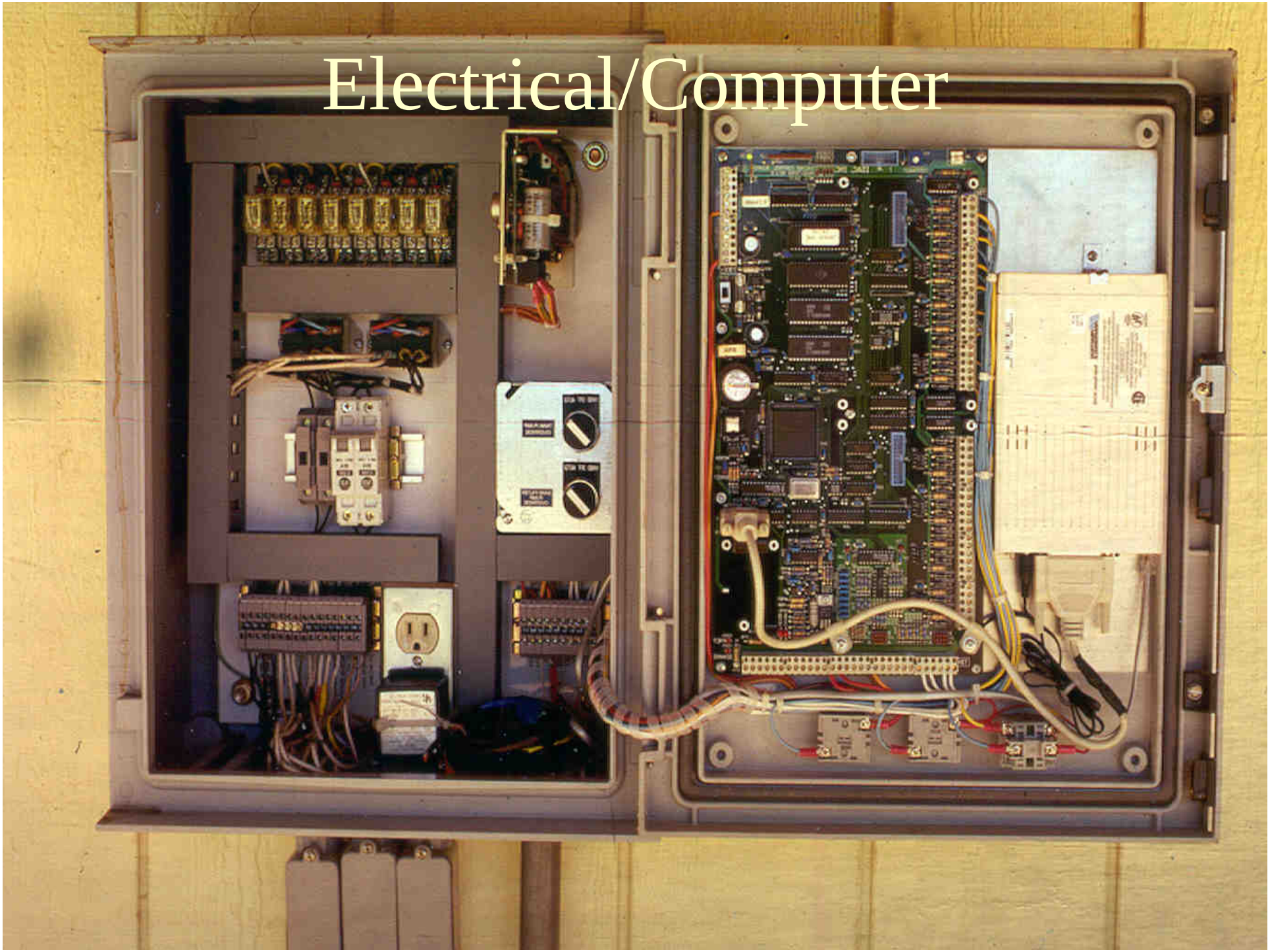

Drip Tubing in soil

Drip Valves

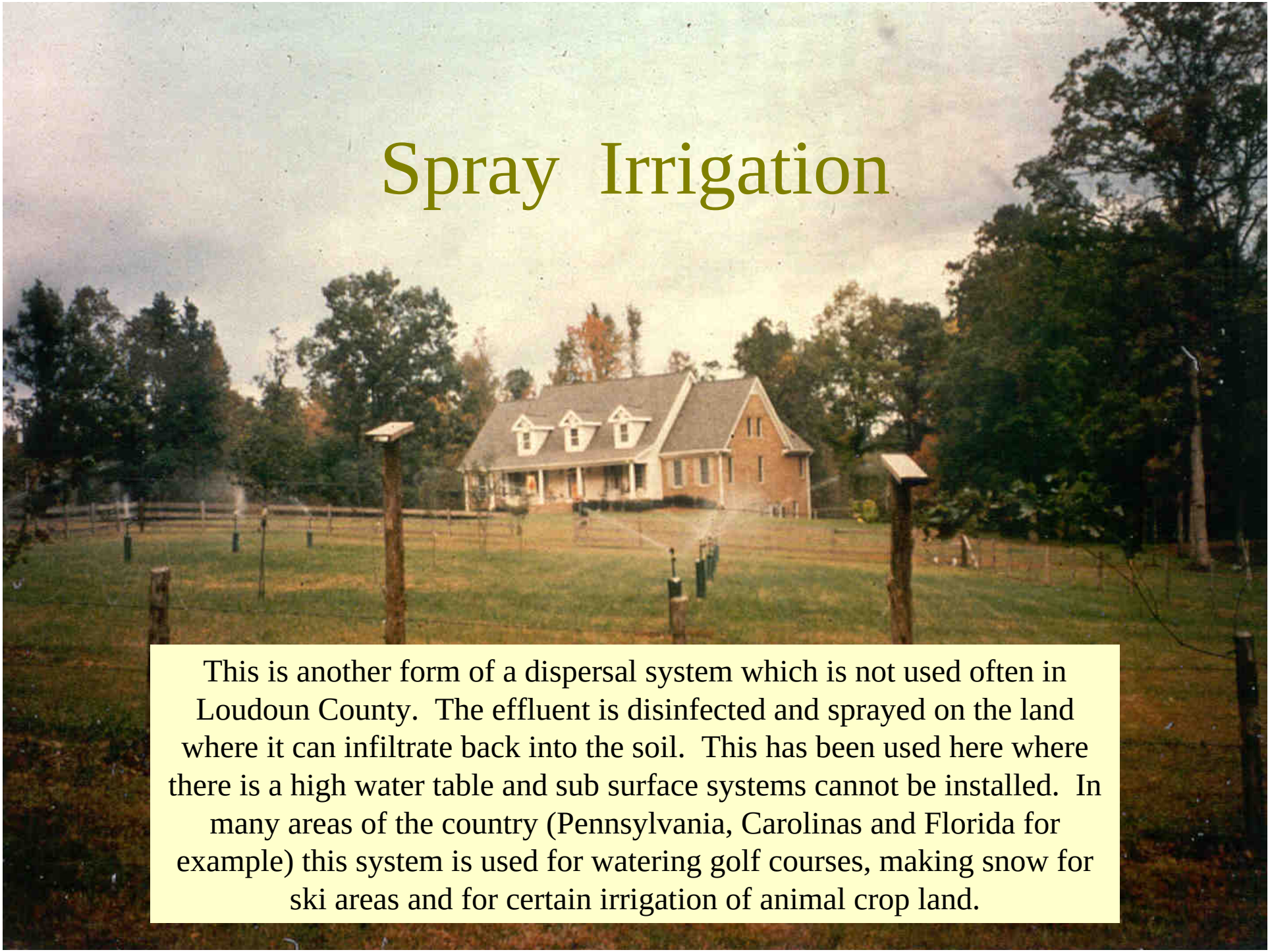


The dispersal system is made up of a series of systems and some form of hydraulic unit is required to disperse the effluent between each group in the systems. The one shown is controlled by a computer.

Electrical/Computer

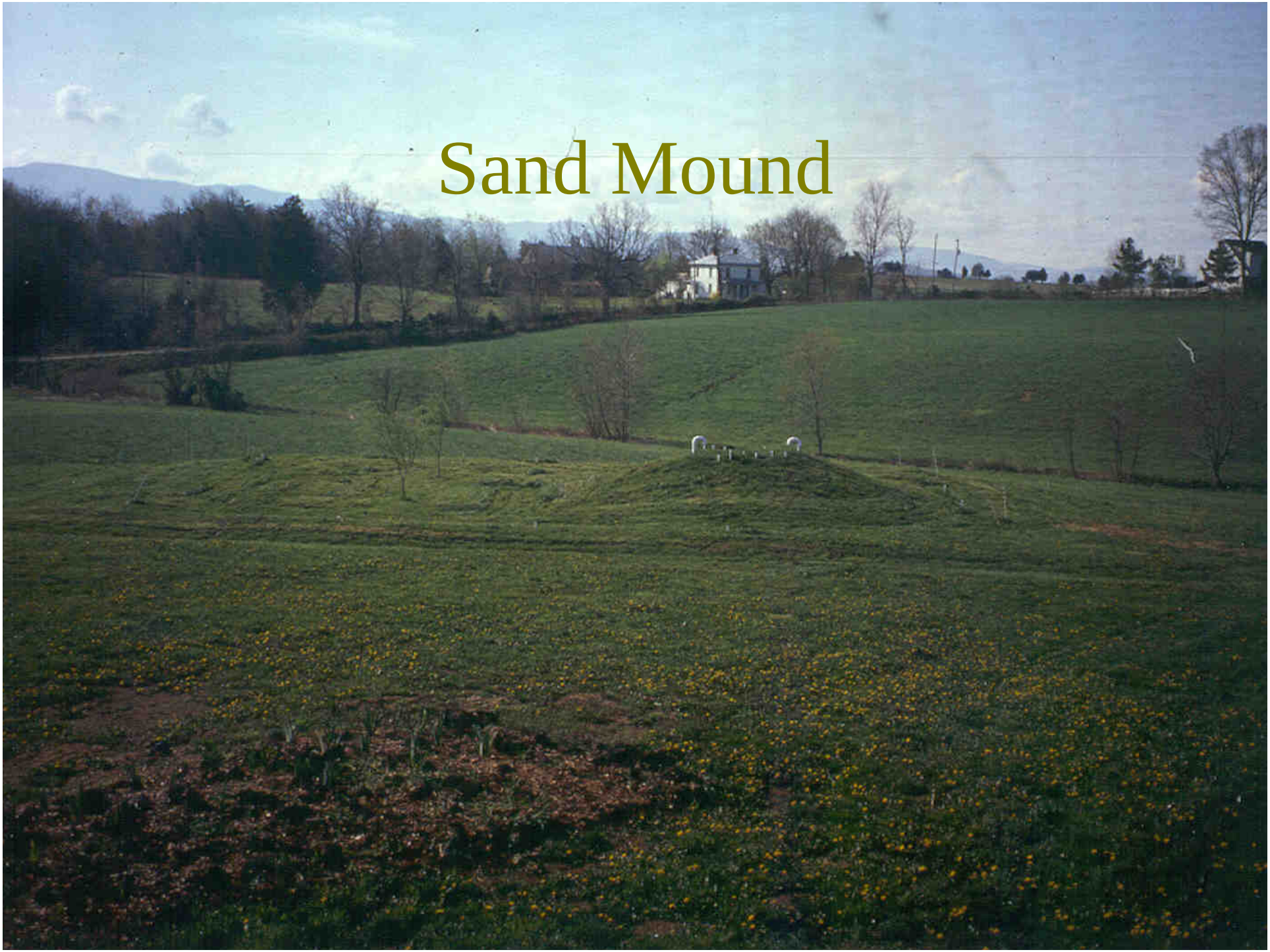


Spray Irrigation

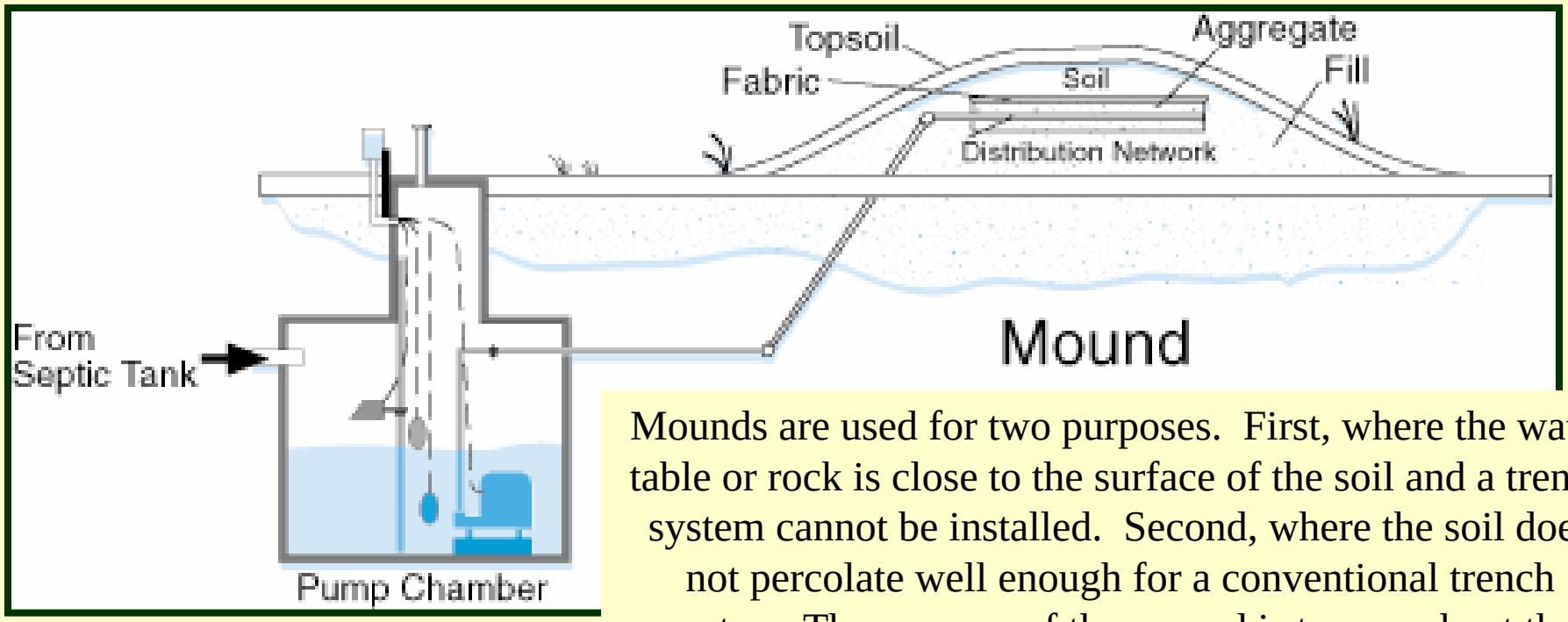


This is another form of a dispersal system which is not used often in Loudoun County. The effluent is disinfected and sprayed on the land where it can infiltrate back into the soil. This has been used here where there is a high water table and sub surface systems cannot be installed. In many areas of the country (Pennsylvania, Carolinas and Florida for example) this system is used for watering golf courses, making snow for ski areas and for certain irrigation of animal crop land.

Sand Mound

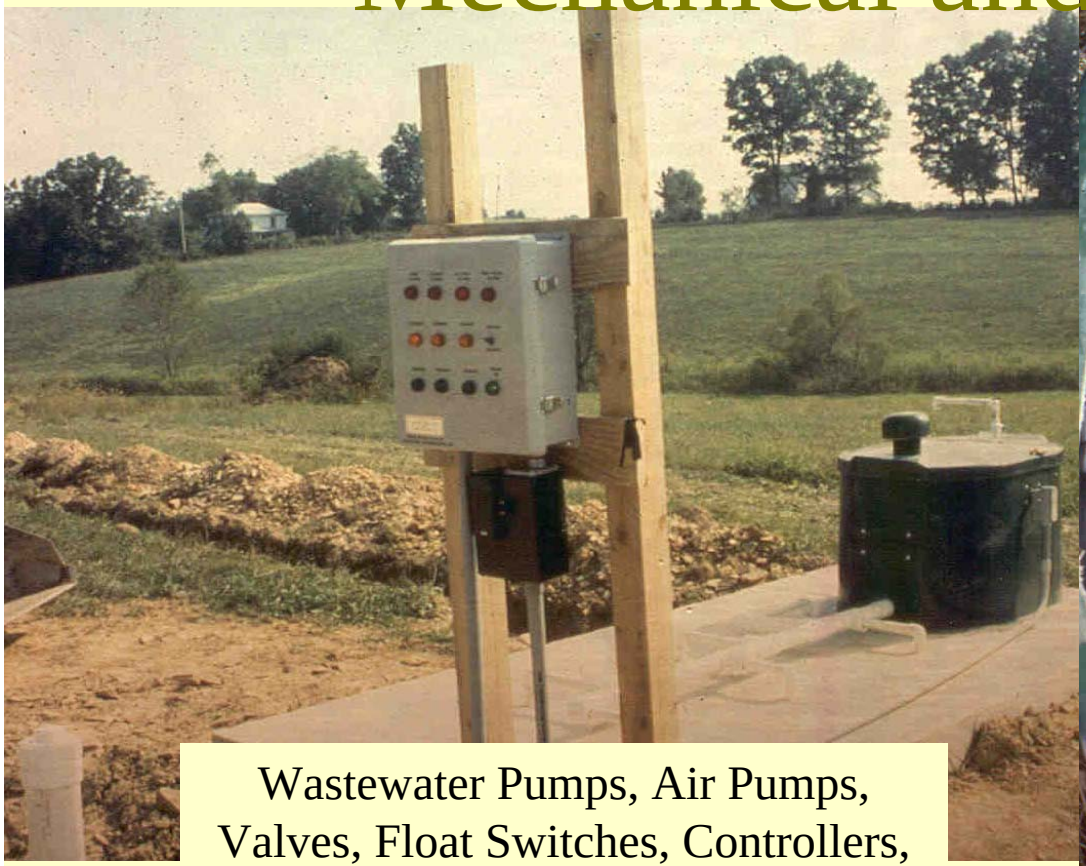


Cut Away of a Mound System

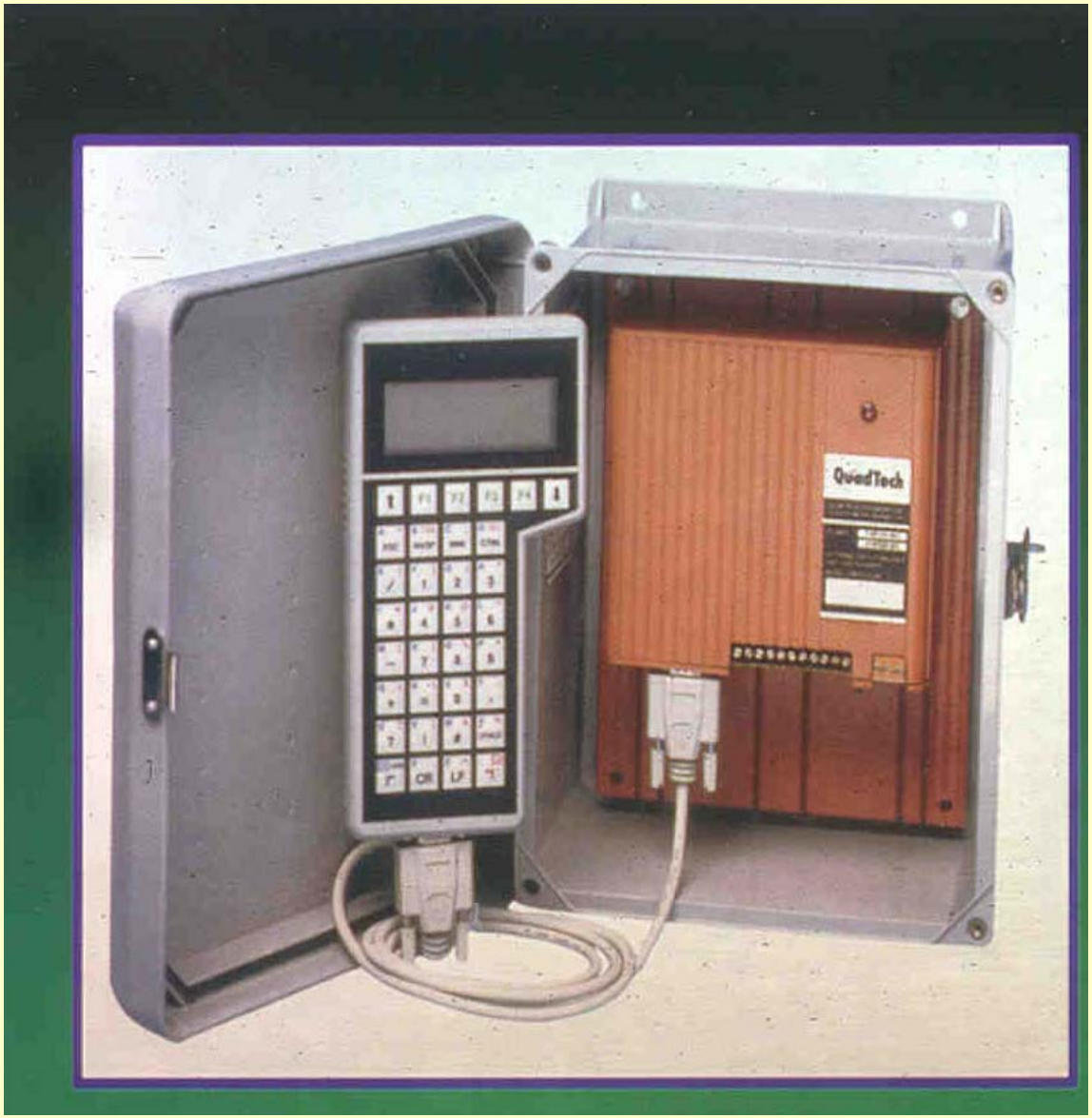


Mounds are used for two purposes. First, where the water table or rock is close to the surface of the soil and a trench system cannot be installed. Second, where the soil does not percolate well enough for a conventional trench system. The purpose of the mound is to spread out the water over a large surface area so that it can enter the soil slowly. There are three types of mound systems utilized in Loudoun County. The Wisconsin Mound as pictured in this presentation, a mini mound utilizing drip technology with the mound, and an experimental system - Aquarobic Mound.

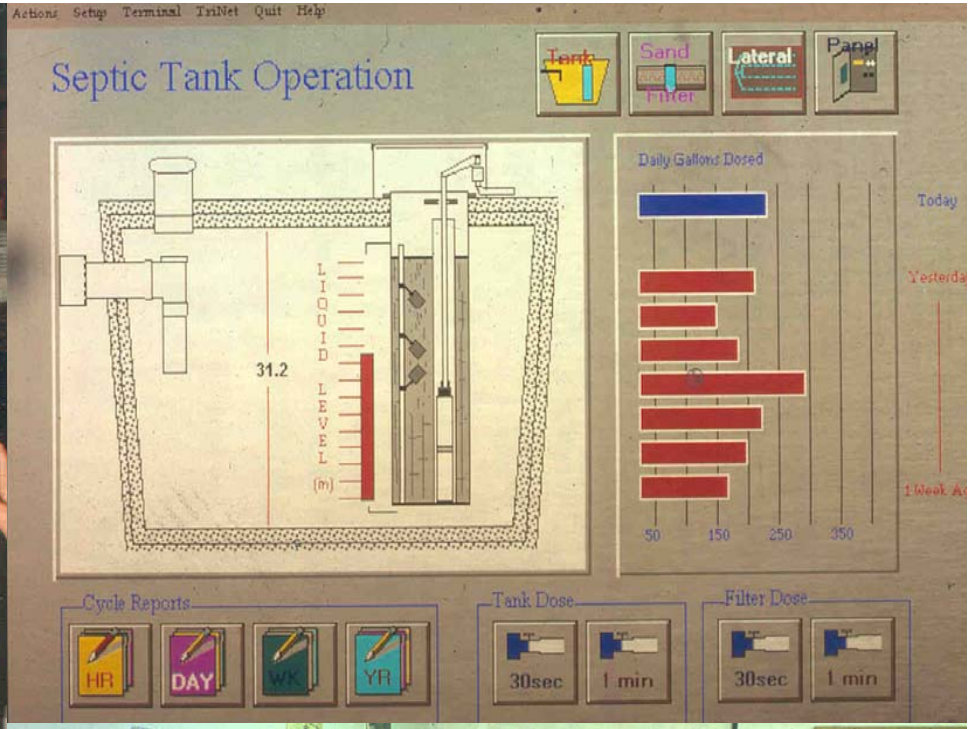
Mechanical and Electrical

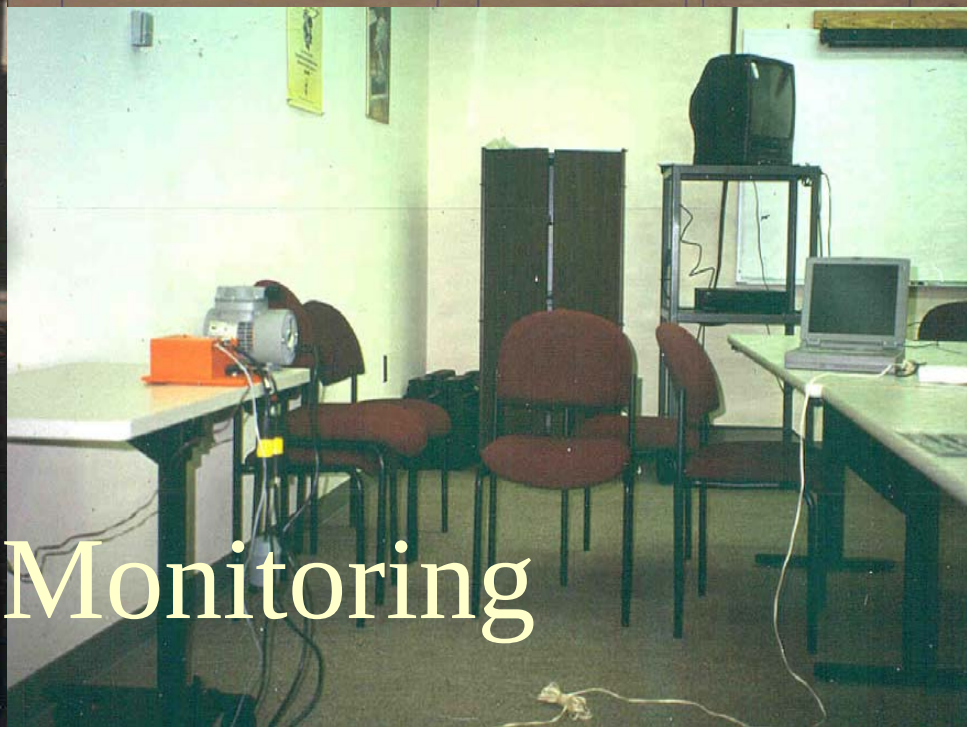


Wastewater Pumps, Air Pumps, Valves, Float Switches, Controllers, Filters, etc. make up many of the systems. Consequently they need to be monitored and serviced.


QuadTech

Systems today can be monitored via the phone lines across the country (just as security systems).





Remote Monitoring

This is an example of no maintenance on a conventional septic tank where the soilds clogged the distribution system.

Need More Info?

- http://www.loudoun.gov/health/water.htm
- http://cfpub.epa.gov/owm/septic/home.cfm
- http://www.vowra.nowra.org/
- http://www.vdh.state.va.us/onsite/index.asp
- http://www.nsf.org/
- Contact Bob Lee,